Harlan Wood

SECOND SCIENTIFIC CLINICAL SESSION — ASSOCIATION PHYSICAL AND MENTAL REHABILITATION — JUNE 3 - 5 — DESOTO HOTEL, ST. LOUIS, MO.

JOURNAL OF THE
ASSOCIATION FOR

PHYSICAL & MENTAL REHABILITATION

Founded by

John Eisele Davis, Sc. D.

BI-MONTHLY ISSUE MAY, 1948

TABLE OF CONTENTS

SCIENTIFIC AND CLINICAL AGENDUM

Thursday — June 3, 1948

CHAIRMAN — THOMAS J. ZWIERLEIN,
Chief, Corrective Therapy U. S. VA Hospital, Jefferson Barracks, Missouri

ASSISTANT CHAIRMAN — PAUL ROLAND,
Chief, Corrective Therapy U. S. VA Hospital, Danville, Illinois

8:30- 8:40—Invocation—Earle A. Ray, Chief, Chaplaincy Division Special Service, Branch Office No. 9.
8:40- 9:00—Welcome and Introductory Remarks—Jack E. Jones, President Association for Physical and Mental Rehabilitation.
9:00- 9:50—The Philosophy of Corrective Therapy—Edw. Greenwood, M. D., Director, Southard School, Topeka, Kansas, Menninger Foundation.
9:50-10:00—Recess.
10:00-10:40—Dynamics of Therapeutic Exercise— Louis B. Newman, M. D., Chief, Physical Medicine Rehabilitation Service, VA Hospital, Hines, Ill.
10:40-11:20—Corrective Therapy for the Blind—Arthur Tauber, Supervisor, Corrective Therapy Department, VA Hospital, Kingsbridge, New York City, N. Y.
11:20-12:00—Research Trends in Corrective Therapy—John E. Davis, Sc. D., Chief Corrective Therapy, VA Central Office, Washington, D. C.
12:00- 1:00—Lunch.
1:00- 1:30—Therapeutic Method Employed in Treatment of Catatonic Schizophrenics—Paul Roland, Director, Publication and Research, APMR, Chief, Corrective Therapy, VA Hospital, Danville, Illinois.
1:30- 2:20—Recent Developments in Rehabilitation—Eugene Taylor, New York Times, Special Consultant, Physical Medicine Rehabilitation Service, Central Office, Washington, D. C.
2:20- 3:10—Implementing Our Program—Geo. T. Stafford, Ed. D., Professor, Phcy. Educ., University of Illinois, Urbana, Illinois, Nat'l. Consultant for Corrective Therapy, USVA, Washington, D. C., Physical Reconditioning Consultant to the Surgeon General, Dept. of the Army, Washington, D. C.
3:10- 3:30—Recess.
3:30- 4:15—H. Worley Kendall, M. D.—President, American Congress of Physical Medicine. Topic to be announced.
4:15- 5:00—Corrective Therapy in Medical Rehabilitation (Paraplegia and Hemiplegia)—Kjell Peterson, Physical Director of Metropolitan Life Insurance Company, New York City, National Consultant for Corrective Therapy USVA, Washington, D. C.

Friday — June 4, 1948

CHAIRMAN — THOMAS J. ZWIERLEIN,
Chief, Corrective Therapy U. S. VA Hospital, Jefferson Barracks, Missouri

ASSISTANT CHAIRMAN —

8:30- 9:00—Corrective Therapy in the Veterans Administration—A. Ray Dawson, M. D., Assistant Medical Director, Physical Medicine Rehabilitation Service, VA Central Office, Washington, D. C.
9:00- 9:40—Physical and Corrective Therapy—Ben Boynton, M. D., Chief Physical Medicine Rehabilitation Division, VA Branch Office No. 10, Dallas, Tex.
9:40-10:00—Discussion.
10:00-10:15—Recess.
10:15-11:45—Amputee Discussion—E. C. Holcher, M. D., Attending Physician, Orthopedics, VA Hospital, Jefferson Barracks, Mo.
11:45-12:00—Discussion.
12:00- 1:00—Lunch.
1:00- 1:40—The Army Physical Reconditioning Program—Cecil W. Morgan, Ph. D., Chief, Physical Reconditioning Section, Physical Medicine, Consultant's Division, Office Surgeon General, Dept. of the Army, Washington, D. C.

1:40- 2:30—Panel on Progress Notes—Frank H. Ewerhardt, M. D., Consultant in Physical Medicine and Medical Rehabilitation; Edw. Greenwood, M. D., Director, Southard School; Joe R. Brown, M. D., Chief, Neuropsychiatric Section, VA Hospital, Minneapolis, Minnesota.

2:30- 3:15—Corrective Therapy and Pre-Frontal Lobotomics—Leo Berner, Chief, Corrective Therapy, VA Hospital, Bronx, New York, and Harold H. Robinson, Chief, Corrective Therapy, VA Hospital, Roanoke, Virginia.

3:15- 3:30—Recess.

3:30- 5:15—Rehabilitation of Chronic Neurological Cases—Joe R. Brown, M. D., Chief, Neuropsychiatric Section, VA Hospital, Minneapolis, Minnesota; Chester Nelson, Chief, Corrective Therapy, VA Hospital, Minneapolis, Minnesota; Eugene Speer, Executive Assistant, Physical Medicine Rehabilitation Division, VA Branch Office No. 8, St. Paul, Minnesota.

5:15- 5:30—Discussion.

7:30 P. M.—Business Meeting—Association for Physical and Mental Rehabilitation, Jack E. Jones, President, Presiding.

Friday — June 4, 1948

CHAIRMAN — HUGH VICKERSTAFF,
Executive Assistant, Physical Medicine Rehabilitation Service,
Branch No. 9, St. Louis, Mo.

10:15 A. M. - 11:45 A. M.—Conference and Discussion on Physical Therapy—Florence Linduff, Chief, Physical Therapist, Veterans Administration, Washington, D. C.

1:00 P. M. - 2:30 P. M.—Conference and Discussion on Problems of Administration—Russell Dean, Executive Assistant, Physical Medicine Rehabilitation Service, Central Office, Veterans Administration, Washington, D. C. (Presented for Executive Assistants, Physical Medicine Rehabilitation Service and other interested groups.)

Saturday, June 5, 1948

CHAIRMAN — THOMAS J. ZWIERLEIN,
Chief, Corrective Therapy U. S. VA Hospital, Jefferson Barracks, Missouri

ASSISTANT CHAIRMAN —

8:30- 9:10—Objective Strength Tests for Measuring the Affected Muscles Involved in Orthopedic Disabilities—H. Harrison Clarke, Ed. D., Director, Graduate Division, Springfield College, Springfield, Mass.

9:10- 9:40—Rational of Rhythmic Exercise in Chronic Low Back Pain—Frank Ewerhardt, M. D., Emeritus Chief of Phys. Med., Barnes Hospital, Washington University, St. Louis, Missouri, Consultant Phys. Med. Rehab., Branch Office No. 9 USVA Hospitals, Consultant Phys. Med. Rehab., USVAH, Jefferson Barracks, Mo.

9:40-10:15—Why Do We Worry About Posture—Josephine Rathbone, Ph. D., School of Physical Education, Columbia University, New York, N. Y.

10:15-10:30—Recess.

10:30-11:45—Gait Training - Cerebral Palsy and Polio—R. E. Bruner, M. D., Med. Director of Cerebral Palsy Division, Missouri Society for Crippled Children, and Physical Medicine Rehabilitation Service staff, VA Hospital, Jefferson Barracks, Missouri.

11:45-12:30—Remedial Activity in a Convalescent Care Program—Robert L. Bennett, M. D., Professor, Physical Medicine, Emory University Medical School, Atlanta, Ga.; Director, Physical Medicine, Georgia Warm Springs Foundation; Chief Consultant, Physical Medicine Rehabilitation Service, VA Branch No. 5.

"REHABILITATION AND ORTHOPEDICS"

By DR. FELIX JANSEY

Faculty Northwestern University Medical School
Consultant Orthopedics, Veterans Hospital, Hines, Ill.

One of the greatest difficulties we have among doctors and patients is letting them know exactly what we are doing. We are all thoroughly familiar with the fact that physiotherapy has had an unpleasant flavor in the minds of many patients and more so among some members of the profession, and yet they do not know what rehabilitation includes, what physiotherapy includes, where the limitations of massage are, and what the different fields in themselves represent. A great many people specializing in these various fields do not know how to define them so they cannot tell others what they are doing, and what their limitations are. Too often you will find conflicting opinions. Your greatest hazard is the conflicting opinions among doctors. There are many doctors who, finding a patient woefully disabled, say "Let's turn him over to physical therapy for a month and see what they can do," having no idea themselves of what can or cannot be done. They either want some miracle to happen so the patient can leave the hospital and go back to work with excellent function, or someone to assume responsibility for their derelictions. This is a tragic situation which can only be corrected by more education among doctors, as well as among you who have special skills and training in rehabilitation to show what can be done.

Many individuals have the idea rehabilitation is new, but there is nothing new about rehabilitation, Watson-Jones has often stated. Plato was the first to express this opinion when he said "This is the greatest error in the treatment of sickness: there are physicians for the body and physicians for the soul, and yet the two are one and indivisible." You can't separate one part of treatment completely from another part. A man with a fracture or injury is ordinarily apprehensive; afraid of the doctor, of you; afraid he may not have his job back; afraid he may not be able to work or be downgraded in his work; or that he may become permanently disabled. We can make no progress with these patients unless they lose some of these fears and begin to understand their own basic problems. You come into very intimate contact with these patients, just as intimate as the doctor or nurse ever does, and occasionally more so. Thus your opinions have great weight with them.

Rehabilitation is not something that should begin after the operation is over, or just as the patient is about to go home from the hospital. Rehabilitation should begin the minute the patient is injured and is placed under friendly care. Rehabilitation should emphasize retaining the abilities the patient has, and perhaps showing him a few he did not realize he possessed. It has been said that it is the "Ability" and NOT the "Disability" that counts. A patient lying in bed with no interests forced upon him usually has nothing to do but think about himself, and begins to hurt at a great many points that have no relation to his present injury. To that extent we must keep a patient alert, cheerful, busy and active. Rehabilitation should begin immediately, be continuous, and therapy be applied frequently.

You are all familiar with the Army routine we had in some general hospitals, where we kept patients busy every hour. You can't spend some part of every hour with the same patient, but insofar as possible you can group these patients as we do, and try to get one of them to supplement the activities you direct. I don't know of anything quite so disheartening to a patient as to have to sit in a physiotherapy room and do nothing but routine exercise. When the patient has an interest and a purpose, he is far more cooperative. Some of the places in England were very well organized. One in Wales was the home of a prominent individual. The individuals brought there had a rare privilege; they had the advantage of beautiful environment, of all the exercises of a modern hospital and doctors who saw them regularly at least once a week. They had a perfectly delightful time apart from the disagreeable things and noises of a hospital, and their rehabilitation proceeded much more rapidly.

Here on the orthopedic service at Hines Hospital there is some difference of opinion as to just what rehabilitation means, and what it can accomplish. As far as I am personally concerned we start a patient immediately with exercises to

———Presented Training Course — Hines Hospital, Chicago.

everything he can move. We have him begin moving progressively. It is important that the patient understand what it is all about—what he is doing. They are told "Muscles like brains, improve with use." We never speak to the patient of a diagnosis in medical terms. We do not speak of adhesions or contractures, instead we explain that things are stuck together; there is a something that has to be loosened, or give him a demonstration. He understands immediately. Explain to him the simple need of glueing ordinary things. We glue paper—demonstrate that. If we move it, it doesn't stick. If we move a knee joint, it begins to yield and draw apart. At the same time he pulls his muscles and makes the knee more limber and active.

Patients learning to walk again have a desperate time. They are afraid. You are all perfectly familiar with the individual who begins to limp, to rotate his leg and begins using his adductor muscles. You are familiar with the routine of correcting those things. The important thing is to begin to correct them while he is in bed; begin to coordinate the muscles; using both extremities, not centering attention on one. If they coordinate well in bed it is amazing how often they get out of bed immediately, and present no problem whatever. When we plan taking out a cartilage or anything else in the knee, we like him to be in the hospital long enough in advance so he understands what simple extension exercises are and so he knews what quadriceps extention and setting are. It is easier to teach him before than after the operation, when he has lost his coordination between brain and peripheral muscles. On these same patients, insofar as possible on the day of the operation as he is coming out of the anesthetic, before he recognizes pain, we begin to get him to contract his quadriceps, moving his knee, leaving him in bed, and in a great many instances on the day of operation they get up and walk without a limp. That is not always done. You see some patients who won't do it because of their fear. If they get out of bed and begin to limp, they are placed right back in bed. They must not acquire a bad habit—they must not limp. It is easier to learn a new habit or routine—or retain an old habit—than break a bad habit. We may acquire it in 2 or 3 days time or a week's time and then take several months—or longer—to get over it.

You are all perfectly familiar with the value of quadriceps muscles exercises in any knee injury, and that routine. Most orthopedists are also perfectly familiar with the treatment following operation. A great many, unfortunately, do not appreciate the value of beginning prior to operation. A few are beginning to realize it is important to do exactly the same routine in shoulder disabilities. Those must be begun early, immediately. You are all thoroughly familiar with older individuals who have shoulder disabilities and have been protected by keeping their arm in a sling in the usual position. They acquire a severe disability, and many after 2 or 3 weeks can move their arm only 3 or 4 degrees. It then becomes a very serious problem in these older individuals to restore movement. We never see that if rehabilitation is begun promptly and carried on continuously.

It has been a tragedy to see patients turned over to physical therapy, and you are familiar with the dangers of passive motion, when there is limited pathology.

In order to get the cooperation of the patient it is highly important to keep his confidence. To get his confidence is the job of the doctor who explains what his disability is, what his prospects are, how much discomfort he is liable to have, and what he is likely to accomplish. Too often doctors are busy. They have only a few seconds for a patient on rounds; they don't take time. Then it becomes your job to retain the confidence of the patient, and, where the patient has a query, not to reply to his questions in technical terms. A patient who hears he has a myofasciitis is very much concerned, but if he hears he simply has a bruised muscle or strain that does not seem serious, and he thinks he is not so likely to have muscle handicaps, he is not so disturbed or confused.

When a patient has an injury of the spine, it is routine to start active exercise, often even before we know his precise diagnosis. He is placed on a hard bed, given appropriate exercises and soon he feels much better and is relieved of some discomfort and a great deal of anxiety. This is started even before x-rays are returned to us.

All patients should participate. If we picked out one patient in the ward and started on him, he would wonder why he alone was picked on. But if he sees every individual in the ward, without exception, get some part of the routine, it

is much easier to carry out. If we have 3 to 12 men in a ward all doing something in this routine, with maybe one or two exceptions, they understand, but if only 1 or 2 do it and the rest do not, the value is not nearly so great. Individuals with spinal disabilities have to start on extension exercises. Some orthopedists like flexion exercises. I have laid stress on hyper-extension and rotation of the pelvis, and those things do not harm any patient, and help in the majority of patients with back pain. They certainly stabilize the patient's back and permit him to be active with less discomfort than other routines. A patient with a fractured spine is started on exercise immediately. He is gotten out of bed as soon as the cast is dry and he is able to lean on the edge of the bed without cracking the cast. He starts on the routine and then is kept out of bed most of the time. Obviously in spinal tuberculosis this routine is modified, but even here breathing exercises, etc., are used.

I think one of the great difficulties we had in the past was the problem of serious disabilities such as causalgia of the arm, leg or hand following some injury. It is interesting to find a whole ward of such patients— an entire ward of serious disabilities, all on a very elaborate physiotherapy routine. They walk from the ward to physiotherapy to get massage and passive motion. They can't move the injured part themselves, so somebody moves the part for them. They had pain and got no better at all. The whirlpool would take off the dry protective epithelium they had on the top of their skin, macerate their hand, so that if you approached them they would shrink with apprehension. It was impossible to do much under that type of management. It is interesting to observe that in this same hospital with an increasing number of such patients, we never saw a single case of the same type thereafter, with adequate rehabilitation routine, and no new cases developed. It is my feeling that a very considerable portion of that type of patient acquired their disability for several reasons. Occasionally this happened because they were neglected early. Others were improperly treated, or overtreated. Most of them are of the apprehensive type who have a low threshold for pain. They are the neuropsychiatric variety. They are anxious and worried, and everything hurts them. They require a lot of attention and should be diverted from their disabilities. These patients who are adequately treated in bed advance, get along very well on the usual and customary rehabilitation procedures—nothing dramatic, but do it repeatedly, frequently, 3, 4, 5, 6 times a day, hourly if possible; from long periods of time to brief periods of time.

I think perhaps the greatest problem we have is in letting people know what can be accomplished. I think an effective manner of correcting the situation is by our good work. Patients compare notes afterward, and they find a patient who had a cartilage out under the old routine, who was placed in a very massive bandage or plaster cast for 2 weeks and kept on crutches for 6 weeks, and then had to use the knee cautiously and often limped. They compare notes with patients who had quadriceps exercise before operation and were out of bed the day of operation, discharged from the hospital with knee motion of 90 degrees or better within 10 days to 2 weeks. They begin to compare the values of these different routines. There is no difference in the operative procedure. But there is a difference in the attitude of the patient, the attitude of the attendants, and finally the attitude of the doctors.

QUESTION: In the ambulation of patients following surgery, do you find that you have much swelling in the knee when you ambulate early?

DR. JANSEY: If, for example, this patient was neglected for 3 or 4 days or a week, and then suddenly somebody wants to give him quadriceps exercise, or begins weight lifting, yes they may suddenly have considerable swelling of the knee. In the ordinary routine there is comparatively little swelling when an ordinary knee operation has been done. If the man had just a cartilage taken out, regardless of whether the incision is a little one or a big one, relatively small amounts of soft tissue in the knee joint have been destroyed, and those swell very little. If a piece of patella, femur, a lot of soft tissue has been exposed, those are likely to swell more. We start these patients in the same way we get them out of bed early, and don't pay much attention to the swelling. We use a compression bandage after operation. This is a massive dressing with a lot of pressure. We don't take the bandage off for two weeks, so we don't look to see whether there is swelling. Following that, where there has been an extensive procedure, there may be persistent fluid, much more persistent after two more weeks in exceptional cases. We disregard it entirely and it generally goes away within two weeks with very few exceptions. I don't think you should be much concerned about fluid.

And that limping proposition if a man does walk. You ambulate him the first day; he goes back to bed if he limps. If he is apprehensive and you can't teach him, he stays in bed. We may keep him in bed for two weeks, this is exceptional. In one instance we had an anxious individual who was concerned about everything; we didn't get him up for 6 weeks. He did not have rehabilitation. Somehow he was missed and nobody got around to him for 10 days. It was then an extremely difficult matter to teach him how to use his quadriceps. He couldn't lift his leg or turn his leg. We didn't let him out of bed until he coordinated. We tried him with the bicycle exercise. If they can flex the joint at all, they can walk. If we have to keep the patient in bed we use the overhead bicycle exercise to ascertain whether it is safe to let them get up and try again. You could have a fracture at the knee which would pierce the knee joint and cause hemorrhage. Such an individual must be protected carefully. He can still flex; it is important that he can flex. He will have synovitis when you begin moving it. Despite this there is still movement. Most patients can tell if the patella is still moving within the cast. Some learn immediately and in some it takes 3 or 4 days. Those patients who have routines of that type get excellent function. I saw a neglected one a week ago; he had no such activity, and that knee joint did not move 5 degrees. He was transferred in from another hospital.

QUESTION: What is the average discharge time postoperatively on lateral menisectomy, barring osteo-dissecans?

DR. JANSEY: From the date of operation it is usually two weeks. In other words, their stitches come out 10 to 14 days after operation, and they are discharged when the paper work is finished.

QUESTION: What is the criteria for discharge?

DR. JANSEY: Usually the patient begins "straining at the leash" about the 8th day he wants to go home.

QUESTION: Do you board on these patients for atrophy?

DR. JANSEY: Yes. We see little atrophy in these patients; they don't have much opportunity to acquire it. It comes from lack of use previously from old or longstanding injuries.

QUESTION: Don't you find atrophy from long disuse of the torn parts?

DR. JANSEY: There is often associated atrophy as in an old avulsion of the cruciate ligament. You won't build the quadriceps up in 2 or 3 weeks in these individuals. If they have learned what to do and are able to walk effectively—to get up and down stairs—it is all right.

QUESTION: Do you always get full extension on those fellows?

DR. JANSEY: I would say almost full extension, because occasionally full extension is painful early. There are a lot of sutures in there. When they think they are fully extended, they are probably flexed 5 or 6 degrees. That comes back to normal.

QUESTION: It will come back, but won't they get a tearing in that joint?

DR. JANSEY: I have partially written up 100 cases. We start quadriceps setting and weight lifting preoperatively, and when the pneumoarthrogram is taken, we can go on with the exercises. He continued until surgery and by 5 days he should have possibly 90 degrees flexion. The sutures are removed in 10 days. He starts weight lifting on the 11th day. We don't let him ambulate until he has full coordination extension and good strength.

STUDENT: Many patients come in with old things of several years standing and have considerable atrophy.

DR. JANSEY: I think you are right, particularly in those who have been protecting themselves who have a slight external rotation in their gait. Those who only have an occasional locking— just a weak knee—will probably have quadriceps almost normal in size, and those with recent injury will have little difficulty. With cruciate and lateral ligaments—we don't keep them in the hospital until it hypertrophies—we will send them to rehabilitation centers. They usually get along so well that they may or may not go. We have them come back to us at regular intervals. It is rarely that we put them back in the hospital.

QUESTION: How about osteochondritis dissecans?

DR. JANSEY: We use the same procedure. We smooth off the edge of the cartilage and let them go These swell up but the fluid is not blood. It is thick, viscid joint fluid. They get over it and do well. If they are active I think you find less fluid and get them discharged sooner. As I said before, I am giving you my point of view. Other orthopedists on the service here do not all agree with me.

STUDENT: They all limp a bit?

DR. JANSEY: Yes, but very little. If the limp is merely one of a short step and a long step, we let them stay up so they can balance. I won't tolerate any other type of limp. Most of them are uneasy and are afraid to move it.

QUESTION: Who tells them whether they will limp; do you have to prepare them?

DR. JANSEY: We usually do prepare them before surgery. We are on the wards daily and our rehabilitation men and residents all think along the same lines, and whoever sees the surgeon speaks to him, "C. asks to use his foot" or "He has been in bed too long." We try to get our nurses to pass a friendly word to the patient which helps a lot.

QUESTION: Elaborate on your shoulder immobilization program. How soon do you start, and under what circumstances?

DR. JANSEY: As a standard routine, the most favorable position of the shoulder is in abduction, and perhaps a little forward motion is desirable. (Demonstration).

The first thing he regains after the cast is off, is his deltoid. That is in individuals who have a lot of disability from a long period of time. As soon as he is able to raise his elbow out of the cast, we begin getting him to lift it. Even if they move it an inch or two; all of this is active motion. If they can move a little they want to hold a newspaper, cigarette or playing cards. He begins moving it, even without your direction; he finds it does not hurt. As soon as he can bring it down as far as the divided cast will permit, we are inclined to remove the cast. He must have the active use of that entire extremity. That is why we don't like splints. They keep tearing the bed-clothes. Patients prefer casts because they can sleep better. In most instances we use a cast.

QUESTION: On your Bankhardt, how long do you keep them immobilized?

DR. JANSEY: I prefer my own operation. If a Bankhardt is done the arm is kept on his side in the Velpeau position. The same with a Magnuson operation. I don't think many Nichola are done here; I don't remember the last one. In these recurrent dislocations with a bone graft, they are kept immobilized for a period of 2 to 3 weeks. They start with a Velpeau bandage. You have to encourage them to bring it beyond 90 degrees even at the end of 6 weeks.

QUESTION: Putting a man in a sling, do you put him in this position?

DR. JANSEY: Never in this position. We put on a triangular sling. (Description).

We let him move his shoulder a bit. If he is in a triangular sling we consider he can do the usual customary exercises, and easily slip it off.

QUESTION: What do you do with cases who have a habitually outward rotation when they walk; in the Army they walked with their foot out.

DR. JANSEY: They did it long before they got into the Army. It is a difficult problem; difficult to break them of that. One of the important things is to get them to realize they are doing it. That is a difficult thing. They don't realize they are doing it. When they begin to get an insight into it, it makes it easier. Often we ask them to walk pigeon-toed. Ask a patient to stand with his feet straight out; he will look at them and do it. Ask him to close his eyes and do it; it is amazing how many normal individuals will stand with their feet turned out. They think their feet are parallel when they are standing with them turned out 15 or so degrees. Try it yourself. When they are parallel they feel that they are turned away in, especially those individuals who have that type of gait.

QUESTION: In spinal fusions and herniated disks, have you a regular set routine?

DR. JANSEY: In tuberculosis we keep those patients pretty quiet where we do a spinal fusion for tuberculosis. For something else they usually stay in bed without a cast for a period of 3 weeks. The cast is put on ordinarily when the stitches are taken out. They are ambulatory as soon as the cast is dry and comfortable. If there is some kind of discomfort and they are worried or anxious, we want them happy. They are instructed that we never want them to sit down. They may lie down, walk around, but never sit down. Obviously the cast would not permit them to do that comfortable if it is adequate. Apart from that there is no particular routine.

QUESTION: After the cast is removed, what type of exercise do you prescribe?

DR. JANSEY: The same as with the cast off. Begin your hyperextension exercise early.

QUESTION: Do you do any hyperextension within the cast.

DR. JANSEY: Yes. Obviously, if he has had a recent fusion, we don't push it nearly so much. If he has a compression fracture he starts at once.

To get back to the patient with a knee disease, it is important to teach them how to run and jump. It is rare at many places to teach them anything about jumping. That is extremely important. In some knees it is amazing to see somebody with an operation of the knee walk upstairs with no difficulty whatever after six months but still afraid to run. You start with his marking time and the first thing you see he is running and has no difficulty. It is amazing how you can talk him out of not being able to run.

Patient operated a week and a half ago; a long incision—(demonstration of what he could do with his knee; full flexion, bending, straightening out to the point of hurting.)

QUESTION: You ambulate the 3rd day? Get out of bed the 3rd day?

DR. JANSEY: Why wait so long? Previously the doctor would not let them up, now they are often up on the first or second day.

When we first started this routine there was a lot of resistance.

QUESTION: On possible disks, or probable disks, do you use conservative treatment?

DR. JANSEY: All of our backs are placed on a hard bed when they come into the hospital, and placed on a routine of hyperextension. This is on my service; that is my routine.

QUESTION: In reference to hyperextension exercise, do you think it best to place the men in flexion at first? While giving hyperextension?

DR. JANSEY: All of the backs straighten out on hyperextension except those who come in with a list or severe, excruciating pain. They will not do it, even if they could. In some you can feel spasm. In those instances most of them will be controlled, as you say, with flexion of both extremities for a few days and then hyperextension exercises. We usually put buckles on that type of traction so when the exercise comes we can release it and get going.

STUDENT: My point is this: Our orthopedist is in favor of hyperextension exercise, but insists on partial flexion while we give it, a pillow under the pelvis area so he is in slight flexion as he does the exercise.

DR. JANSEY: When he talk about backs I am afraid to generalize. I think the diagnosis of a back is more difficult than some other things. The differential diagnosis of low back pain is very complicated. If we generalize, some of you may carry away the wrong impression. All of these things are subject to certain exceptions in particular cases. Ordinarily we don't put the pad under the back. Ordinarily they are on a routine of a hard bed board with a firm mattress. Occasionally we have an individual who has discomfort when that is done. We will put in a small lumbar support which may be nothing more than a folded sheet. In some instances an old stiff patient finds a pillow convenient. We don't do it unless it is necessary. We do that not oftener than one in twenty-five; just a guess.

QUESTION: What part does physical therapy play?

DR. JANSEY: You define physical therapy. To some, physical therapy would include all the rehabilitation program. The term physical therapy was so bad they had to change the name. Now, when we begin to talk about Physical Medicine people don't know precisely what that means. Some include rehabilitation in a program of Physical Medicine and some do not. It is difficult to understand what these fields represent because they represent different things to different people. You are clear in your own minds what is included but the medical profession is not—as a whole. Some just haven't the faintest idea. You tell me what you mean and how you limit physical therapy, rehabilitation, massage, diathermy, infrared and the other various types of modalities? Once in a while we use heat but very infrequently. I am talking now now about Rehabilitation. It is a matter of defining your terms.

QUESTION: What about heat for the back?

DR. JANSEY: They talk me into it once in a while. You can do perfect rehabilitation in a barn if you have the confidence of the patient. If you produce inspiration and perspiration. You just must inspire the patient yourself. You must have his confidence. Then you can do anything. It is the toughest job in the world if the patient does not have confidence in you and does not understand what is expected of him and he is afraid. If he has to depend upon something extra, as a light or other appliance, his recovery is not going to be as quick as that of some one who can do the same things without infrared or an appliance. There are indications where those adjuncts are necessary, but they are not ordinary routine patients.

STUDENT: Many of us run across osteomyelitis of the tibia, with the patient in a cast; do you use dorsiflexion, plantar flexion of the toes?

DR. JANSEY: It depends on what operation was done. If you have a 2-inch bone segment missing, one must be cautious, but where you simply do an incision and drainage, take out a bit of bone and have open or closed treatment, rehabilitation is the same. Ordinarily they start raising their legs at once. It is better to lower it slowly than to drop it. We are more cautious about getting them out of bed. If there is a low grade infection, that does not change the routine much. If there is an elevation in temperature, we postpone activity. If the temperature and pulse are normal, they are treated no differently than any one else.

QUESTION: In this particular case we had just now, can you give us specific treatment. What about his daily activity all through; occupational therapy?

DR. JANSEY: Occupational therapy is desirable. We encourage them to go to the far end of the building for occupational therapy. We encourage them to go to far away places to encourage walking. As nearly as possible, with all backs or knees, we send them to the gym and as far as we can send them routinely. They do an excellent job in backs. I think the long walk is important. It consumes a lot of his time. The ordinary routine for these patients is to begin in bed and go to the gym, as soon as they are able to walk. Very often we forget to send them for a week or two. Just an oversight. These men do almost as well as those who have gone down. I don't think that the gymnasium is the sole or important thing. It is, however, a good thing and we try to send them all down. I wouldn't answer as to whether this particular patient went to the gym.

QUESTION: How much rehabilitation could be done on a patient with a fractured femur in traction? Is there any possibility of this man getting too heavy to ambulate well?

DR. JANSEY: Obviously it is important that the traction be applied well and that the patient in apparatus is well counter-balanced. It is then possible to do a considerable amount of activity including raising up in bed, chinning himself, swinging from side to side, and use both upper extremities, and to do adequate breathing exercises. Whenever a patient is overweight he always is placed on a low-caloric diet and such other medical measures as may be indicated.

ROLE OF CORRECTIVE THERAPY IN PRE-FRONTAL LOBOTOMY CASES

By DR. HILAND FLOWERS
Chief Neuropsychiatric Service, and Corrective Therapist

LEO BERNER, MURRAY CHRYSTAL, MURRAY APPEL, JOHN METZ,
Bronx Veterans Administration Hospital

Pre-frontal lobotomy is a delicate surgical procedure in which the association fibers of the pre-frontal area of the frontal lobe are irretrievably severed. In order that adequate results might be attained, the operation is performed on both lobes. It should be emphasized that the fibers that are severed do not show any histological abnormalities, therefore, we cannot at the present time, infer that these cases have an organic pathological origin. In short, pre-frontal lobotomy comes under the general classification of psychosurgery which simply means an operation on the intact brain for the purpose of relieving mental abnormalities.

In the selection of cases suitable for pre-frontal lobotomy, certain criteria have been set up (1). They include the following:

(a) The operation is to be used only for those patients who are chronically ill, have not responded to other forms of therapy and are not likely to recover in the future.

(b) In schizophrenia, the duration of illness should be at least two years, they should have had insulin or electric shock therapy or these should be contra-indicated.

(c) In the manic-depressive psychoses, there should be a history of repeated attacks over a period of years with increasing periods of incapacity, this incapacity must exist for at least 50% of the time and the attacks shall not have been shortened by convulsive shock therapy.

(d) In the involutional psychoses (depressions or agitations) it should be done only as a last resort to patients with illnesses over three years duration who have failed to respond to at least two series of electric shock therapy or for whom this treatment is contra-indicated. It may also be used if the life of the patient is in jeopardy because of the effects of the condition on the patient's physical health or because of the unusual danger of suicide.

(e) The operation is not to be performed on alcoholic and drug addicts, psychopaths, homosexuals or other sexual deviants. In cases that have shown aggressive psychopathic behavior traits prior to the onset of the psychosis, the operation is to be considered only with the greatest of caution.

In the evaluation of the post-operative observations of pre-frontal lobotomy cases, it is essential that caution be employed. Thus far, the clinical results seem to indicate that paranoid and catatonic schizophrenic cases improve considerably and hebephrenics improve the least, but some good results are obtained in every category of schizophrenia. The results for involutional phychosis are also very encouraging.

In the immediate post-operative period, lobotomized patients show the various clinical phenomena described in detail by Freeman and Watts (2) including stupor, confusion, memory impairment, incontinence, and a tendency to perform rhythmic repetitive acts. This state, which may be due to the trauma incurred as a result of surgery, is superceded by a drastic alteration in the personality as compared to the pre-operative personality. For example, a depressed agitated white male with profound feelings of guilt and sinfulness, became a boisterous, overactive, facetious, untidy extravert, completely unhibited and oblivious to the sensitivities of his fellow patients. Conversely, an impulsive, hyperactive, threatening manic, who regularly castigated people with bitter invective became a docile, childish patient, and assisted with light tasks when requested.

In reviewing the specific symptoms of lobotomized patients pre and post-operatively, it is interesting to note that while such symptoms as depression, asociability, combativeness, hallucinations and delusions are alleviated or disappear, new symptoms appear as a result of the operation.

These symptoms are lack of initiative (inertia, lack of spontaneity or drive), moderate untidiness and carelessness, indiscretion of speech, indifference for the events of the future and distractability. It is with these symptoms that we in Corrective Therapy are concerned and the rest of this paper will deal with the role that Corrective Therapy plays in alleviating these symptoms which may render the unstimulated patient inert mentally and physically. It is well to remember that therapy does not begin and end with lobotomy.

Corrective Therapy is instituted the day the patient arrives at the hospital. The corrective therapist assigned to the case endeavors to secure as much information regarding the patient as possible. This information is of great importance in the establishment of rapport between the therapist and patient. The information is obtained through various means. The patient's case history will indicate his past behavior; the daily reports written by the ward nurses give a picture of his present behavior; the attendants of the ward may have some vital information concerning the patient's daily conduct; and lastly talks are held with the patient's family in order to obtain any information on previous interests, hobbies or sport activities.

Treatment may begin by merely talking with the patient and gradually introducing him into a simple one-response athletic skill. For example, catching and returning a ball; bouncing a ball; throwing a quoit at a peg from a short distance or any other very simple skill.

When rapport has been established, the patient is introduced into graded activities commensurate with his past skills and the results of his performance are recorded daily upon the form "Observations and Findings of Corrective Physical Rehabilitation Activities in Relation to Pre and Post-Operative Pre-Frontal Lobotomy" as seen in Figure I. This form was devised and developed by members of the Corrective Therapy section with the aid of the Chief of Psychological Research for Branch Area No. 2. As can be readily seen, it serves two purposes; first it is a method to re-educate lobotomized patients and secondly it is employed to gather statistics for research purposes.

In introducing a patient in an activity, the therapist is constantly evaluating the patient's behavior. The almost invariable post-operative symptom, lack of initiative, is evaluated and graded by the observations listed from A to E inclusive on Figure 1. The patient is marked on a zero to three basis; zero indicates no response, one indicates a lethargic response, two signifies an average or good response and three shows a hyperactive response. The patient's response is always graded by the same therapist in order to achieve some form of objectivity.

The other post-operative symptoms, moderate untidiness and carelessness, indiscretion of speech, distractability, indifference for the events of the future are dealt with in the following way. In the space provided for additional observations and findings, the therapist daily inserts his findings relative to these symptoms. The patient is continually made conscious of these symptoms in order that they might be eliminated. The therapist will attempt to explain their undesirability in the simplest manner possible.

For example, a patient cursed violently at another patient who was catching a softball several feet away from him. When the therapist asked the reason for this outburst, the patient replied that he was afraid of being hit by the ball. The therapist then pointed out to him that there was no need to curse since the possibility of his being hit by the ball would easily be eliminated by his moving to another area on the field. Another example is that of a patient who had the habit of leaving the bathroom partially undressed. Each time this happened, the therapist would point out to the patient that this behavior was unacceptable to the other patients and asked him to return to the bathroom and make himself suitable before returning to activities. The cooperation of some of the more advanced patients was also enlisted in order to overcome this habit, and after a number of these incidents, the patient was finally able to overcome this unacceptable behavior trait.

In order to gain more insight of the patient's progress, the therapists treating lobotomized patients meet weekly with the psychiatrists. At these meetings, the therapist will report on the patient's reactions during the week and will ask any pertinent questions pertaining to the patient's behavior. The psychiatrist will explain the reasons for the patient's particular behavior to a situation in order that the therapist be given a better insight for this behavior. Again, the therapist may report an observation which has great significance to the psychiatrist. Thus, a patient who had remained mute post-operatively, was coaxed into speaking through the medium of a language which he had been familiar with in his early life.

OBSERVATIONS AND FINDINGS OF CORRECTIVE THERAPY ACTIVITIES IN RELATION TO PRE AND POST-OPERATIVE PRE-FRONTAL LOBOTOMY

Name	Diagnosis	Date of Operation	C.T. Instructor

ACTIVITY—	Pre-Operative Observations	Post-Operative Observations
DATE		
a) Attitude towards activity		
b) Attention span		
c) Coordinated, purposeful movement		
d) Ability to compete		
e) Ability to partake in group		

ADDITIONAL OBSERVATIONS AND FINDINGS:

1.—Untidiness and carelessness in attire.....

2.—Indiscretion of speech.....

3.—Distractability .....

4.—Indifference for events of the future.....

Our short experience with pre-frontal lobotomy cases precludes a fuller analysis of the role that Corrective Therapy can play in these cases. We feel sure, however, that our value in treating these cases has been established and accepted by the psychiatric service.

References—

(1) Chipkin, I.—"Pre-Frontal Lobotomy," New York Report at Bronx VA Hospital, October 14, 1947.

(2) Freeman W. and Watts J.—Psychosurgery, Baltimore. Charles C. Thomas, 1942.

CORRECTIVE THERAPY FOR PARAPLEGICS

By VINCENT BRUNO, B.S., JULIUS LEVIN, B.S., DANIEL BENNETT, B.S.,
Corrective Therapists, Halloran Veterans Administration Hospital,
Staten Island 2, New York.

PART I — PHYSICAL RECONDITIONING

A Paraplegic is a patient with a lesion of the spinal cord resulting in the loss of essential function from the site of the lesion downward, with impairment of normal function, in part or in toto, of the nervous, muscular, digestive, circulatory, excretory and reproductive systems.

The rehabilitation of Paraplegics in Corrective Therapy includes the performance of many activities essential to their daily needs for living. For purpose of discussion, these activities have been classified into three phases:

1. Physical Reconditioning.
2. Crutch Walking.
3. Daily Activities.

This paper, the first in a series of three, will deal with the administration of Corrective Therapy preparatory to CRUTCH WALKING, namely PHYSICAL RECONDITIONING.

The primary principle underlying the entire Corrective Therapy program for Paraplegics is **self activated** movements directed toward the restoration of maximum self care abilities fostering the patient's independence and productivity compatible with his residual function. It is of utmost importance that the therapist stimulate and encourage the patient in order to induce his diligence and perseverance. Once a receptive and cooperative frame of mind has been developed, maximum benefits may be attained from treatment. The importance of patient cooperation and receptiveness is strongly stressed in Betsey Barton's book, "NOW TO LIVE AGAIN—"Only when mind and body and heart are focused and coordinated as one on each act, will the strength of the whole person be brought to bear upon healing, will healing advance at its greatest possible speed."

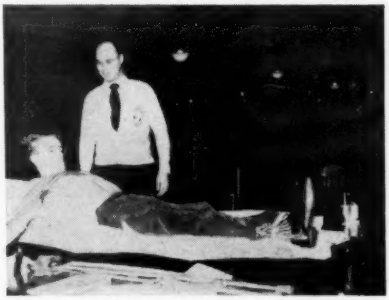
Physical reconditioning for paraplegics is a prescribed, planned, continuous, and progressive process designed to restore and improve the patient's physical fitness to its highest possible degree through the administration of exercises. The muscles of the arm and upper body must be developed to compensate for loss of leg power. In order to achieve this end, extensive physical development is necessary. To develop muscular strength as rapidly as possible the "overload principle of exercise" has proven to be of great value.

It is of vital importance that exercises be given to the limit of the patient's tolerance and within his physical limitations. Exercises should facilitate physical reconditioning and should not prove an exhausting or damaging experience, as too much exercise produces muscular soreness and over irritability.

Physical reconditioning is best accomplished by an early start and by maintaining continuous treatment. The following exercises have been formulated in an effort to achieve maximum physical reconditioning benefits:

1. STRYKER FRAME OR BED EXERCISES.
   a. Objective—To prevent or retard physical deterioration which normally follows prolonged bed rest.
   b. Areas of Concentration—Shoulder girdle, thoracic area, and upper extremities. (When possible the abdominal and pelvic areas.)
   c. Techniques—Mild graded exercises with emphasis on free arm movements, application of light weights and springs, coordinated with deep breathing exercises.

Spring Exercise.



2. MAT EXERCISES.

a. Objective—To restore and increase the strength, flexibility and coordination of arms and upper body in anticipation of ambulatory demands.

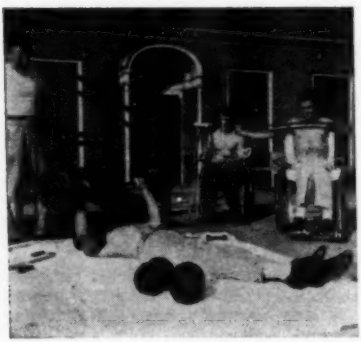
b. Areas of Concentration—Shoulder girdle, upper extremities, and back muscles. (When possible abdominal and pelvic area and lower extremities.)

c. Techniques—

1) Graded exercises involving progressive weight lighting and spring exercises for purposes of strengthening.

2) Free arm swinging, stretching and balancing exercises are administered for development of flexibility and coordination.

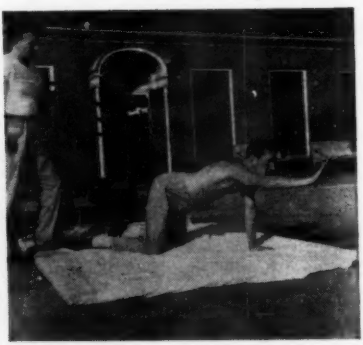
3) Remedial exercises are utilized for the restoration of function of weakened and affected muscles presenting typical problems.



Weight-Lifting and Spring Exercises.

Short-Crutch Exercises.

Stretching Exercise.



Balancing Exercise.

3. WHEELCHAIR EXERCISES.

a. Objective—To develop strength and coordination of shoulder girdle and upper extremities.

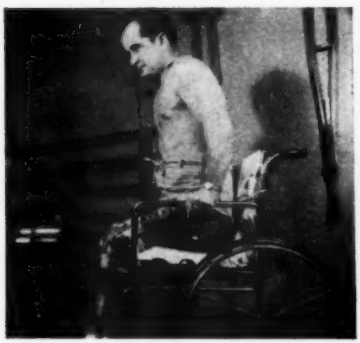
b. Areas of Concentration—Shoulder girdle, upper extremities and back muscles.

c. Techniques—

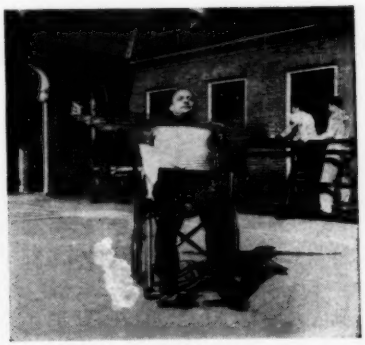
1) Graded wall-pulleys and spring exercises, chinning and seated pull-up for development of strength.

2) Free arm movements to restore and improve balance.

3) Wheel chair management (propelling and controlling foot rests.)

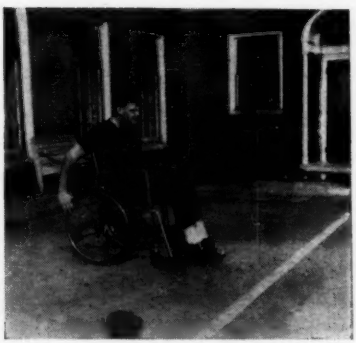


Seated Push-Up.



Spring Exercise.

Balancing Exercise.



Wheel Chair Propelling.

4. PARALLEL BAR EXERCISES.

a. Objectives—To assist in retaining an optimum state of health and as media for pre-ambulation instruction.

b. Areas of Concentration—All muscle groups with residual function.

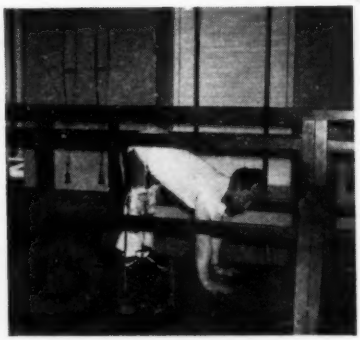
c. Techniques—

1) Bending and stretching excerises for flexibility.

2) Balancing exercises to promote coordination and posture.

3) Resistive and wegiht bearing exercises for development of strength.

4) Preliminary walking gaits preparatory to crutch walking.



Bending Exercise.

Chinning Exercise.

Resistive Exercise.

Walking Gait.

Weight bearing exercise is the one activity found to be of paramount importance in helping to stimulate the functions of the body systems essential for retaining good health. In a survey, based upon direction questions, conducted among thirty-eight paraplegic patients who are actively engaged in an exercise program the following results were recorded:

	YES	NO
1. Has exercise or ambulation helped you feel better?	95%	5%
2. Has exercise or ambulation helped you to improve your appetite?	66%	34%
3. Has exercise or ambulation helped to temporarily relieve any of your spasms?	67%	33%
4. Has exercise or ambulation helped your voiding?	71%	29%
5. Has exercise or ambulation helped your bowel movement?	45%	55%
6. Has exercise or ambulation helped you to sleep better?	71%	29%

Although the above mentioned survey reflects the patients' opinions, it is believed that the findings indicate a trend toward substantiating the fact that patients who participate daily in exercise and ambulation receive some physiological or psychological benefits which contribute toward the patient's sense of well being.

Once the patient has successfully completed the physical reconditioning phase of Corrective Therapy, his next objective is the mastery of the skills and techniques of "Crutch Walking" which will be discussed in a subsequent paper.

"Published with permission of the Chief Medical Director, Department of Medicine and Surgery, Veterans Administration, who assumes no responsibility for the opinions expressed or conclusions drawn by the author."

"BEHAVIOR OF HEART IN EXERCISE"

By F. A. HELLEBRANDT, M. D.
Director Baruch Center of Physical Medicine and Chief, Division of Clinical Research, Baruch Center of Physical Medicine

I should like to consider the behavior of the heart in exercise, for it is the heart which speeds up the circulation. This capacity of the heart to work harder than usual depends on a peculiar property of muscle tissue. THE GREATER THE LENGTH TO WHICH THE MUSCLE IS STRETCHED DURING RELAXATION, the greater the force of its subsequent contraction. So important is this phenomenon that it is called the LAW OF THE HEART. The heart muscle is stretched during relaxation by the fluid entering it from the reservoirs known as the auricles. Thus, the greater the quantity of fluid entering the reservoirs, the greater will be the stretching of the heart muscle during its period of filling, and the greater the force of the subsequent contraction. If the filling of the heart is greater than usual, a larger amount of blood than usual will be automatically pumped out into the arteries. In exercise there is a great increase in the return of blood through the veins to the heart, and this particular property of the heart muscle ensures that all the extra blood coming to the heart shall be passed on without delay to the arterial side of the system. THE STROKE VOLUME of the heart, or the blood pumped by it per beat, is thus automatically controlled by the amount of blood coming to the heart from the veins. Now obviously, the heart cannot go on stretching indefinitely. Dilitaton of the heart is a dangerous and undesirable thing, beyond certain limits. How do we prevent it from going to irreversible lengths? The method is simple—by surrounding the heart with a fibrous and inelastic coat which prevents it from stretching to a point which would lead to injury of its fibers. This is known as the pericardium and is the sack within which the heart resides. What then, happens when the heart has reached the limit of filling which the pericardium permits, and when there is an accumulating mass of blood in the venous reservoirs which cannot be moved forward. When the heart ceases to be able to accommodate any more blood at each beat, the pressure of the increasing volume collecting in the big veins and auricles will tend to rise. This rise stimulates certain nerve endings in the walls of the auricles, and these in turn, send messages to the medulla and so down to the heart again, demanding that it beat not any harder but that it beat faster. Thus by increasing the force of the heart and thereby pumping out more blood at each beat, and by simultaneously increasing its rate of beat, the heart can put out a greatly increased amount of blood per minute.

It must be quite obvious from what has been said, that in exercise of any duration, the power of the heart muscle is an all important determining factor in the physical performance of the individual. It is not surprising therefore, to find that the weight of the heart is relatively large in proportion to the body weight in creatures accustomed to strenuous exertion. In any type of animal this ratio, heart weight, body weight, body weight is always greater in the wild than in the domesticated species. The highest ratio known is found in the greyhounds: For every 7½ pounds of body weight, the greyhound carries 1 pound of heart muscle. The stag follows with a ratio of 1 in 8½. Man, on the other hand, has 1 pound of heart for every 50 pounds of body weight. From this we must conclude that physical exercise is not a function of primary importance in the life of man. But even in man the size of the heart varies with the amount of work demanded of it. Of the athletes examined at the Amsterdam Olympics, the proportion of heart weight to body weight was greatest in professional runners 1/40, 1/45 in distance cyclists, 1/50 in skiiers and 1/55 in rowers. It is a matter of general experience that when a man goes into training the bulk of his muscles actually increases in size and the same holds true in the case of heart muscle, (CZECH ATHLETES).

Since the heart muscle is stronger in the athlete, it can pump more forcibly and so expel more blood per beat than can a less well-developed heart. Under ordinary conditions, therefore, it can afford to beat more slowly than the average man's delivering the same amount of blood per minute but in fewer and larger beats. As a general rule such is the case. For example at the Amsterdam Olympics the average resting HR of sprinters was 66, of middle distance runners 63, long distance runners 61 and marathon runners 58.

When the oxygen consumption of the untrained man had increased five-

———Presented Training Course — Richmond, Virginia.

fold, his HR had risen to 160 and he was in a state of exhaustion. At this point the HR of the trained man had risen on to 108. Moreover, he was able to increase his output of work still further, and at a degree of exertion requiring an eight-fold increase in oxygen supply, his PR had not risen above 140.

From what has already been said, it must be clear that the driving power which forces the blood from the arterial to the venous side of the system is the blood pressure in the main arteries leaving the heart. If this pressure could be increased it would materially assist in forcing the blood round at an increased speed. ARE THERE ALTERATIONS IN BLOOD PRESSURE DURING EXERCISE? Of course, blood pressure goes up. How is this brought about? 1. An increase in the output of the heart will obviously elevate the blood pressure. 2. Constriction of the arterioles, hindering the escape of the blood from the arterial system, would also lead to a rise in pressure of the fluid contained therein. This also occurs during exercise, since many areas clamp down their blood supply in order to shunt the fluid to parts where it is more urgently needed. 3. Another method of increasing the blood pressure would be to increase the total volume of blood in the circulation. Now the volume of circulating blood is also increased during exercise. The spleen is the organ chiefly responsible for this effect by reason of its sponge-like structure. The capillaries of the spleen open into large spaces or sinuses which behave as a kind of backwater, their contents mingling only very slightly with the general circulation. Large numbers of RBC find their way into the spleen reservoirs during rest. The spleen increases considerably in size under the pressure of these accumulating cells. Now the spleen contains a good deal of muscle tissue and at the commencement of exercise, even at the warning of it, this muscle contracts, practically obliterating the blood spaces, and the contained blood which is composed almost wholly of packed RBC is poured into the active blood stream, materially increasing the volume of the blood returning to the heart.

Under normal conditions the average man has about 3½ liters of blood in circulation. The average rate of the circulation at rest is from 3-7 liters which means that any particle of blood takes from a half to one and a quarter minutes to go completely round the body. In severe exercise this rate of circulation can be increased four to five-fold, that is a complete circulation now occurs in 8 or 9 seconds. One wonders how efficiently the muscles take advantage of this increase in blood flow. The crux of the matter in the capillaries for it is at this point in the circulatory system that exchanges can occur between the blood and tissues. There are over a thousand capillaries in a square mm muscles in the horse, a square mm being about twice the area of a pin head, about 2,500 in the dog, 3,500 in the rat. It has been estimated that if all the capillaries in all the muscles of a man could be placed end to end, they would stretch two and a half times around the globe! Moreover, a surface of 1½ acres is thus exposed through which blood and tissue fluids can exchange dissolved substances. When muscles are in a resting state, only a fraction of this huge area functions for about 1/10th of the capillaries are open at any one moment. When the tissue round these open ones has been thoroughly served with oxygen and its waste products removed, the capillaries contract down again. Meanwhile others, previously closed, are opened up by the relaxation of their walls. In resting conditions, therefore, each muscle fiber needs only an intermittent blood supply. WHEN MUSCLE CONTRACTS all this changes. There is an immediate requirement for oxygen at all points. The waste products formed cause the capillaries which are at the moment contracted to open and this will result in about a ten-fold increase in the capacity for blood of this particular capillary system. If the rate of blood flow to the muscles remained unchanged, this would result in a slowing of the rate of flow through the capillaries to a tenth of its previous rate. If the rate of blood flow to the muscles was at the same time increased by speeding up the rate of the pumping of the heart and increasing the volume of blood discharged by the pump per stroke, then the rate of flow through the widely dilated capillaries will be unaltered or only very slightly slower than before, but the blood is now brought into contact with ten times as much tissue as before. The slight slowing of the blood through active muscles is actually an advantage, for time is thus given for a greater unloading of oxygen and uptake of CO2 and other waste products by the blood.

Every 100 cc of blood carries about 18½ cc of oxygen. At rest, only some 6 cc are given up to the tissues. In severe exercise, this figure is increased to 10-12 cc, that is, about twice as much oxygen as usual is given up to the tissues by every volume of blood passing through. Notice that there is a large margin of safety, for one-third of the initial load of oxygen remains in the venous blood when it returns to the lungs for re-oxygenation.

The heart is capable of coping with the great increase in demands made upon it by exercise by virtue of certain adaptations to its functions as a pump. It is a remarkable feat, for so small an organ, to be able to work continuously for all the years of an individual life. The most marked anatomical difference between heart and skeletal muscle is this: whereas in skeletal muscle each fiber is a separate entity, in heart muscle the fibers link up with one another. The whole heart may therefore be regarded as one enormous muscle fiber. Thus, under normal conditions there can be no isolated contraction of different parts of the heart. If a stimulus is strong enough to make any part of the heart contract, then the whole heart will contract. This is obviously advantageous.

Heart muscle differs from skeletal muscle in another essential respect. In all types of muscle each contraction of a fiber is followed by a short period, the refractor period, during which the fiber is unable to respond to a second stimulus. Now in heart muscle, the refractory period actually lasts throughout contraction and until the heart muscle has relaxed about half way. Cramp-like prolonged contractions such as occur in skeletal muscle, therefore cannot occur in the heart. (ILLUSTRATE HOLDING BICEPS STATICALLY). As far as heart muscle itself is concerned, therefore, it is admirably suited to its function. It is forced to relax between each contraction, and when it does contract, the whole of the muscle contracts at once. Thus it forms an excellent pump. Unlike skeletal muscle, the heart does not work happily on an accumulator mechanism. It never incurs an oxygen debt. It cannot afford to work to the point of exhaustion, as do the skeletal muscles, for in so doing it would endanger the whole body. Rather than do this, it will slow down its rate of work and refuse to meet the extra demands made on it by other tissues in the body. These in turn are thus forced to curtail their activities. One other mechanism serves to protect the heart from undue strain. If the blood pressure for any reason rises abnormally high, the heart might have difficulty in pumping out more blood against such a pressure. The presence, both in the aorta and in the arteries going to the brain of nerve endings sensitive to high pressure guard against this contingency. When the blood pressure rises to dangerous levels, these nerve endings are stimulated, and the nerve centers in the brain responsible for the correct functioning of the circulation are warned. They can then induce an automatic reduction in this high blood pressure by one or the other of two methods. The heart can be automatically slowed by reflex action, so that blood is pumped into the arterial system less rapidly than before, thus lowering the pressure, or the clamps on the arterioles all over the body can be loosened so that the blood can escape from the peripheral end of the arterial system more rapidly than before. It is obvious that either method will reduce the head of pressure in the arteries and thus protect the heart from damage.

To recapitulate, we have thus far learned several things: first, that the energy for muscular contraction comes from the combustion of fuel; second, that the combustion of fuel demands an increased supply of oxygen to the contracting tissues; third, that the ventilation of the lungs is adequate to give to the blood all the oxygen the tissues need and more; and fourth, that the heart and blood vessels are provided with a number of automatic controls which speed up the circulation so that the added oxygen supply might be delivered to the tissues. The next problem to discuss briefly is the method utilized for the transport of oxygen from the lungs to the muscles.

The chief carriers for oxygen are the RBC. They constitute almost half the bulk of the blood, and make it possible for normal blood to transport about 18½ cc of oxygen for every 100 cc of blood. The substance in the RBC responsible for the carrying of oxygen is the hemoglobin. Under ordinary conditions oxygen will diffuse from a region of high pressure to one of low pressure. Now the oxygen pressure is higher in the lungs than it is in the blood coming to the lungs. When blood is brought into contact with this pressure of oxygen it takes up its full complement, or 18½ cc for every 100 cc of blood. The oxygen diffuses through the alveolar walls of the lung into the tissue fluid, then through the capillary wall into the blood, traverses the plasma, penetrates the wall of the RBC and attaches itself to the Hb. The blood remains long enough in the lung capillaries for it to become very nearly 100% saturated with oxygen. Actually, under ordinary atmospheric conditions, the Hb takes up about 98% of its full complement of oxygen. So much then for the picking up of the oxygen in the lungs. The oxygen is carried in the blood stream to the tissues. When the capillaries are all widely open but the tissue not very active, there may be a high pressure of oxygen throughout and little will be needed from the blood streaming by. BUT IF

THE TISSUE IS ACTIVE, as are the muscles in exercise, then in spite of the open capillaries with their richly oxygenated blood, the tissues will be using oxygen so rapidly that its pressure in the muscles will be low. Under these conditions we should expect oxygen to diffuse rapidly from the RBC to the muscles and this is exactly what happens. The Hb parts with its oxygen very readily under these conditions. In strenuous activity almost the whole of the 18½ cc of oxygen carried per 100 cc of blood may be given up to the muscles. The supply of oxygen to the muscles may be given up to the muscles. The supply of oxygen to the muscles could be still further increased if, in exercise, the blood could be made to carry more than the usual 18½ cc of oxygen per 100 cc of blood. Since the Hb present is already fully, or very nearly 100% saturated, an increase in oxygen-carrying power could be achieved only by an increase in the amount of Hb present. Such an increase could be easily and quickly effected by increasing the number of RBC in any given volume of blood, and THIS IS FOUND TO OCCUR IN EXERCISE. An increased concentration of RBC can be brought about either by a decrease in the volume of blood plasma so that more than 50% of the blood is now composed of cells, or by an increase in the actual number of RBC in circulation. Actually both methods are employed.

A short vigorous spell of exercise in a group of muscles will cause them to become swollen and tense. The fluid causing the swelling can have come only from the blood. If most of the muscles in the body are exercised at the same time, the resulting loss of water from the blood will lead to a higher proportion of RBC and therefore a higher proportion of Hb in any given volume. This inhibition of fluid by the muscles is a direct result of the activity of the tissues. The metabolic breakdown products of muscular exercise increase the concentration of certain molecules in the muscle, thus causing water to diffuse in from the less concentrated blood until a molecular balance is re-established. The copious sweating which occurs during exercise likewise, brings about a concentration of the blood and a relative increase in the number of oxygen carries per unit volume. Finally, extra RRC are swept out of stagnant areas, large numbers previously dormant in the spleen for example being made available as oxygen carriers during exercise.

The foregoing analysis of the changes taking place in the circulatory and respiratory system during exercise has served to indicate the wide range of the adjustments possessed by these systems and the conditions under which the adjustments are brought about. But if the exercise is to be efficiently carried out, something more than the mere existence of these adjustments is required. It is essential that the extent to which they are called into play should be correlated with the activity of the muscular system, and that the supply of oxygen which is the outcome of these adjustments, should neither outstrip nor lag behind the needs of the body. Some mechanism must therefore exist, whereby the activities of the muscles, the nervous system, the heart and the lungs are coordinated and linked together in such a way that the resources of the body are utilized to the best advantage and the body acts as a physiological whole. The completeness of this coordination is a measure of man's efficiency as a muscular machine, and any disturbance or failure in this correlation at once lessens the range of his activities. It is necessary then to consider the means whereby this coordination is effected.

Foremost among the initial coordinators is the CNS. Its influence is clearly seen at, or even before the beginning of exercise. The outflow of impulses from the motor cerebral cortex to the muscles is accompanied by a simultaneous outflow or overflow to the respiratory, vasomotor and cardiac centers in the medulla, and there appears to be a very close correspondence between the intensity of the impulses to the muscles and to the vital centers in the medulla, so that, for example, when a man starts to run, the immediate increase in his PR, BP and respiration is more than marked than if he starts to walk slowly. Voluntary movement is often initiated by antecedent psychical process of the most varied nature and intensity. When these are mainly emotional, they may in themselves, bring about a rise of BP, and an increase of PR and pulmonary ventilation which have been termed anticipatory. Simultaneously there occurs a toning up both of the muscles and of the whole nervous system, which causes them, so to speak, to stand at attention. These changes are very noticeable in a runner who is waiting for the signal to start in a race.

The effect of these initial changes is to provide for an increased supply of oxygen, to the muscles, brain and heart from the outside, and at a time when the other mechanism which regulate the respiratory movements and the minute-volume of the heart, have not yet come into action. Although the influence of the higher centers upon the vital centers in the medulla is of paramount importance at the beginning of exercise, it is not easy to estimate how far this outflow of impulses from the higher centers persists throughout the period of exercise, and how far it is supplemented or even replaced by other coordinating mechanisms of a different character. On the whole it is believed that the coordinating action of the CNS is not confined to the initial stage of exercise, but that these higher centers send out a continuous stream of impulses, not only to the skeletal muscles, but also the medullary centers and that these continue throughout the exercise.

At the same time, other mechanisms play a large and often a predominant part in coordinating the activity of the rest of the body with that of the skeletal muscles. The processes whereby, during exercise, the activity of the skeletal muscles is correlated with that of the rest of the body are two in number. The first is the mechanical action of the active muscles in returning blood more rapidly to the heart. The circulation rate through the body is determined by the output of the heart per minute and this depends partly on the venous inflow. The increased venous inflow to the heart during exercise, though aided by the vigorous respiratory movements, is DUE MAINLY TO THE MECHANICAL ACTION OF THE ACTIVE MUSCLES WHICH DRIVE THE BLOOD BACK TO THE HEART. In this way the muscles act as a second pump; the combined action of the heart which drives the blood into the arterial system, and into the blood vessels of the muscles, and of the active muscles which rapidly return the blood to the heart, results in a large acceleration of the circulation rate round the body.

All the evidence goes to show that partly in virtue of the law of the heart, partly by increase of the PR in response to reflex action, the output of the heart per minute automatically increases with the venous inflow. Consequently, the correlation between the work done by the muscles and the output of the heart can be effected by a purely mechanical process; namely the rate at which the blood is driven from the active muscles back to the heart.

There is no doubt that the hydrogenion concentration of the blood, or the acidity of the blood as a result of the accumulation of the metabolic wastes of exercise, is one of the means by which the supply of oxygen to the muscles is brought into relation with their needs during exercise. This brings us then to a discussion of the LIMITS OF MUSCULAR EXERTION. A man's maximum working power is determined not only by the functional capacity of his skeletal muscles, but also by the supply of oxygen to the muscles, heart, and brain. In the last analysis it is dependent upon the extent of adaptations possible throughout the body as a whole. It may be worth reviewing the various things known to limit the speed and force of muscle contraction.

The SIZE of muscle will certainly be the decisive factor in regard to the force of contraction. The muscles of a mouse and an elephant are very much alike in general structure and method of working, but the difference in muscular power is enormous. Closer to hand one has the comparison between the muscular power of a small child and a grown man. Their muscles are alike except in regard to size.

Muscle length also modifies the force of contraction. If we take two identical muscles and stimulate both with a maximal shock so that all the fibers contract, one fact that comes to light at once. The force of contraction is dependent on the resting length of the muscle, that is, ON ITS LENGTH BEFORE IT BEGINS TO CONTRACT. Skeletal muscles are attached to the bones in such a way that in the resting limb they are kept just slightly on the stretch. When a muscle is removed from the body, it becomes shorter owing to its elasticity. It can exert its greatest pull when its resting length is exactly that which it has in the intact body. If it is overstretched then it fails to puss so strongly, while it is not fully stretched it expends a lot of energy in reorienting itself to the contracted state without recording tension externally. When its initial resting length is only three-fifths of that found in the body then the whole of its energy of contraction is dissipated in this way. You can probably recall from your own experience how in one body position some movement is much more easily made than when the body is held in another way. If you try to analyze what is happening you will find in general that when you want to produce a forceful movement you are stretching the muscles which are about to contract.

The maximum tension set up in a muscle occurs at the beginning of a contraction for the muscle is then at its optimum length for energy production. As soon as the limb moves as a result of its action, the muscle shortens and ceases to develop so much tension. Theoretically therefore, our muscles would give their maximum tension if they were not allowed to shorten at all and this is true in practice for short period of activity. In physical therapy we call this "muscle setting." In the steady isometric contraction, although the muscle maintains its optimum length for maximum energy production, it tires much more rapidly since it can neither get oxygen nor have its waste products removed. For any but the briefest periods of work, the isometric contraction, though theoretically the most economical, is in practice the reserve. A greater force is exerted by a muscle if it is allowed to shorten slowly than if the contraction is rapid. The resistance to change in shape which we find in muscle is due in part to the VISCOSITY OF THE MUSCLE. This resistance due to viscosity is proportional to the rate at which the change is made. Human muscle is a viscous-elastic structure, and because of this the maximum amount of work should be obtained from a muscle if it could be induced to contract infinitely slowly, for it would then have to expend no energy in overcoming its viscous resistance. It seems at first sight that our efficiency of movement should increase the more slowly we work. If instead of measuring the external work done, we estimate the extra oxygen used by the body in the doing of the work, we come to a different conclusion. It is often important to know the speed at which muscles should move in order to give the greatest output of work for the smallest extra energy production. There is an optimum speed for most types of movement. It does not pay to move either too fast or too slowly. You know that this is so from experience. You can become just as fatigued by walking too slowly as by walking too fast. Every person has an optimum rate and this does not vary greatly in ordinary men of approximately the same size. The relationship between speed of movement and the efficiency with which it is done is shown for stair-climbing in the ILLUSTRATION. The man used for this experiment climbed 78 steps a number of times, varying his speed on each occasion so that he took from ½ minute to 6 minutes for the total climb. His efficiency was greatest when he took one and a half minutes. At three times this speed his efficiency fell to half the maximum for much more energy was used in overcoming the internal resistance of the muscles contracting so rapidly. The reason for his decreased efficiency at speed below the optimum is also not far to seek, for although the muscles were expending less energy in overcoming internal resistance, they were having to remain in a contracted condition for a longer time. The optimum speed of any muscle movement is therefore determined by these two opposing factors: in a rapid contraction energy is wasted in overcoming internal resistance, while in a slow contraction energy is used to maintain the contraction for a longer time. One factor therefore in determining the possible performance of a runner is the viscosity of his muscles. At the Amsterdam Olympics, the fastest sprinter there was found to have a lower muscle viscosity than any other male runner examined.

LONG BED CRUTCHES

By HERBERT H. DIXTON

Chief Corrective Therapy, Oakland, Calif., V. A. Hospital

Due to lack of Corrective Therapy space and equipment at some hospitals, it is sometimes necessary to improvise certain types of equipment which will fulfill the needs of the patient. The above picture shows a simple piece of equipment, "Long Bed Crutches," which can be made very easily and can be utilized very effectively in the treatment of the majority of bilateral amputee cases.

In cases where the longest stump heals first, the patient can start using these crutches long before he receives his artificial limb. After several practice sessions, if he is in an orthopedic bed, he will be able to get up on the crutches by himself. Psychologically, standing with the aid of these crutches gives a boost to an amputee's morale for he feels elated, that once more, he is high enough in space to feel that he can look down at some things in his environment (prior to using these crutches, he has been sitting or lying for such a long time that he usually feels that in relation to space he has to look up at everything in his environment).

"Long Bed Crutches" will help to strengthen the patient's hands, wrists, and arms, and give him the opportunity of learning to balance on crutches while still in bed. (When using these crutches, the longest stump is the one used for weight bearing). Balancing, with crutches, on a bed, is not too easy a task. However, if a bilateral amputee can learn to balance on a bed, with the aid of the "Long Bed Crutches" is will make the difficult process of learning to balance on artificial limbs that much easier for him.

Although the primary use of the "Long Bed Crutches" is for strengthening the patient's arms and learning to balance himself, they also give the Corrective Therapist an opportunity to correct postural faults due to incorrect crutch use. The following is a list of some of the things that should be brought to the patient's attention:

1. Keep the hips level, instead of leaning toward the side of the longest stump. (Actually too much cannot be accomplished toward correcting this fault while the patient is still in bed, but it offers a good opportunity to impress upon him its importance).

2. Stand erect, instead of hunching or slouching.

3. Keep the head back, not dropped forward.

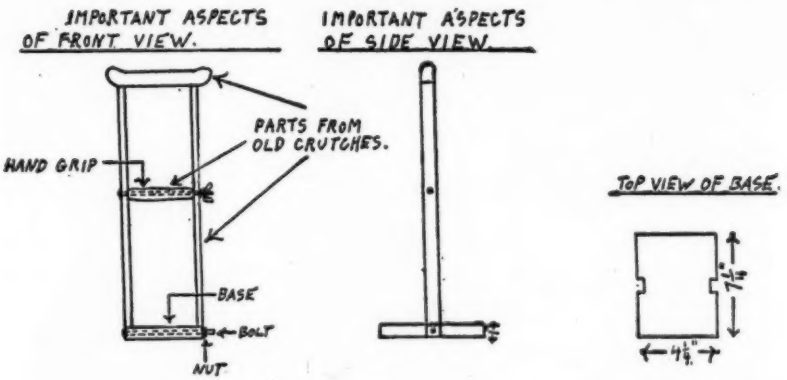
4. Let the hands do their part, rather than carrying all of the weight on the armpit rests.

If the Therapist so desires, these crutches can be used in the "stump toughening" process. At first the patient can bear weight on the end of the stump with a pillow placed beneath it. As his tolerance is built up, a blanket may be substituted for the pillow, and finally the patient bears his weight directly on the mattress.

The "Long Bed Crutches" can also be utilized during the intermediate stage of treatment. Occasionally a bilateral amputee, who is in the early ambulatory stage of treatment, will revert to bed-patient status due to one of a number of reasons. For example, perhaps a tender spot has developed at the end of his shorter stump or a bruise has developed in his crotch. In either case, he can still use the bed crutches to prevent his triceps (sometimes referred to as "pushing muscles" from atrophying, and also retain somewhat his sense of balance. The depressed feeling usually accompanying a setback of this nature is also somewhat alleviated, if bed-crutches are utilized.

The patient shown above, only had the opportunity of using the "Long Bed Crutches" a few times, and he was already well advanced in his treatment at the time these crutches were introduced. Although he had been practicing walking, with prosthetic legs and the aid of crutches, the most obvious fault has been his poor posture. He is usually bent too far forward, with his buttocks sticking too far out. However, it was discovered that this fault was not present while using "Bed Crutches." Perhaps this is due to the fact that if the patient stands near the front of the bed, he usually is not afraid of straightening up, for if he should lose his balance and fall backward, he will fall on the bed.

LONG BED CRUTCHES



Note:: The making of "Long Bed Crutches" does not involve any expense, for they can be made very easily out of the parts of old broken crutches.

"NOTES OF INTEREST"

AAHPER CONVENTION NOTES

An interesting display at the convention was that of the Physical Reconditioning Section, Physical Medicine Division, Office of the Surgeon General, Department of the Army. This display, which is accompanied by movies, illustrates very clearly the work done by this section in the Army hospitals. The display was under the supervision of Cecil W. Morgan of the Consultants Division, Physical Medicine, Office of the Surgeon General, Department of the Army.

Many contacts were made in the name of the APMR with the officers of the AAHPER and especially pleasant were those with Ruth Evans, President-Elect, and Ben W. Miller, Executive Secretary-Treasurer. These people were very interested in the work being done by Corrective Therapists in the field.

An interesting visit was arranged by Arthur K. Flanagan, Consultant, Rehabilitation and Recreation, The National Society for Crippled Children and Adults to the Kansas City Rehabilitation Institute. This unique institution, which has recently opened, shows a trend of community planning which is cropping up nationwide in the field of rehabilitation. The Institute staff was most cordial and cooperative to the group.

Mr. Zwierlein was fortunate to spend much time with Mr. Cecil Morgan discussing mutual problems of hospital procedures and was able to obtain Mr. Morgan as a speaker at the National Convention in June at St. Louis.

Attending the convention were George T. Stafford and Josephine L. Rathbone, both who very very kind in assisting Mr. Zwierlein, making valuable and proper contacts as well as giving the many people asking about hospital work the answers about the work as they know it.

2ND ANNUAL CONVENTION NOTES

The De Soto Hotel offers excellent meeting room facilities with a large ballroom (air conditioned) and an elevated stage for the Clinical Session meetings and the Business Meeting. In addition two large conference rooms and a large exhibit room will be available for the convention.

The Convention Committee have plans for some fine exhibits pertaining to the field of rehabilitation at the convention. Those attending should be interested in the exhibits that have been contracted.

The St. Louis Convention Bureau will have representatives at the Information and Registration booth to aid those attending the convention and their families in seeking information and entertainment.

The Convention Committee hopes that members will send in their registration fee and hotel reservations as early as possible so as to facilitate the handling of same. The staff handling the convention is small and are trying to have everything run smoothly for those attending the convention but need everyone's cooperation.

BASEBALL FANS ATTENTION—June 2nd, 3rd, 4th (night games). June 5th (afternoon game). Reserved Seats $1.85. General Admission $1.35. Tickets—Advance Sale, write to The Cardinal Baseball Ticket Office, Arcade Building, St. Louis, Mo. These games will be sellouts and the Convention Committee advises that those desiring tickets obtain them by mail before the convention. NO TICKET RESERVATIONS WILL BE HANDLED BY THE CONVENTION COMMITTEE.

WEDNESDAY — JUNE 2, 1948

12:00 A. M.-12:00 P. M.—Registration and Information Desk will be open in the lobby of the De Soto Hotel. Hotel reservations and registrations may be checked at this facility.

7:30 P. M.—Meeting of the Representative Assembly, Association for Physical and Mental Rehabilitation. Room will be announced.

REPORT ON AMERICAN ASSOCIATION FOR HEALTH, PHYSICAL EDUCATION AND RECREATION CONVENTION

The APMR representative at the AAHPER Convention at Kansas City held April 19-23 was Thomas J. Zwierlein, Chief, Corrective Therapy, VA Hospital, Jefferson Barracks, Mo. Mr. Zwierlein filled in at the last moment for Jack Jones, President, who was unable to attend due to the Executive Assistants Conference in Washington. Our association was invited to present a paper at the Therapeutic Section meetings at the convention and Mr. Zwierlein presented a talk on "Education in Daily Living Through Corrective Therapy."

The Therapeutic Section meeting was attended by about 200 and a fine program was offered. Especially interesting to us in the field of Corrective Therapy were the papers by H. Harrison Clarke of Springfield, Mass., and Arthur S. Daniels, Ohio State University, Columbus, Ohio. Both papers dealt with the future training and scope of Corrective Physical Education. Especially interesting was the report by Mr. Clarke on the training plans for those interested in entering the field of Corrective Physical Education.

A great deal of interest was shown in the phase of work that is being done in Veterans Administration and private institutions by physical educators during the Therapeutic Section meeting and in talks with various AAHPER members by Mr. Zwierlein.

A full report of the convention and the possibility of the APMR affiliation with the AAHPER will be made at the Business Meeting of the APMP at St. Louis in June at the National Convention.